MT. DIABLO UNIFIED SCHOOL DISTRICT
COURSE OF STUDY

COURSE TITLE:	**Digital Innovation and Design**
COURSE NUMBER:	**009142**
CBEDS NUMBER:	**7221**
DEPARTMENT:	**Career Tech**
LENGTH OF COURSE:	**Year long**
CREDITS PER SEMESTER:	**5 credits**
GRADE LEVEL(S):	**12th**
REQUIRED OR ELECTIVE:	**Elective**

PREREQUISITES:

Required -	**None**
Recommended -	**Algebra I (recommended)**
	Coding and Gaming (recommended)
	Webpage Design (recommended)

BOARD OF EDUCATION ADOPTION: (Date of Action Meeting)

COURSE DESCRIPTION:
Students will explore the potential of technology to solve modern human problems by applying design principles used in art and business. They will design, field test, and evaluate their own projects that use technology to solve local problems. The course will examine the "magic" of how computers and the Internet work, and how logic helps digital devices communicate and understand one another. The course will strengthen students' critical thinking and logic skills as they evaluate the effective use of technology and weigh the legal and ethical questions that may occur with technological solutions. Students will be exposed to a range of professions that use digital technology.

COURSE PURPOSE:
Digital Innovation and Design is a capstone level course for students wishing to deepen their understanding of web, application, and software development.. The purpose of the course is to prepare students to become pragmatic and analytical thinkers who are fluent in 21st century technological skills – as such the curriculum is tied very closely to real world applications and career options in computer programming and interactive design. Throughout the course students are asked to analyze problems in order to construct logical solutions based on concepts rooted in an understanding of fundamental computer science principles. Students will be asked to construct programs and applications in response to real and complex problems through project based learning. Students will also be expected to grow as collaborators in a technical context. Students will consistently participate in critiques, group projects and otherwise support one another.

Students will demonstrate skill in using industry-standard development environments to design and program websites and mobile applications as well as an understanding of computer science concepts that are translatable to many different programming environments and languages. Thus students who take this course continue to explore interactive design career pathways such as video game and software application design, website architecture and webpage design, and mobile application development. Finally, students in this course participate in rigorous large-scale cross-curricular projects involving a practical understanding of economics, technical project management, product life cycle, and transferrable career skills such as communication, collaboration, and public speaking.

COURSE OUTLINE:
Unit 1: The Computer Science Revolution

In this brief, introductory unit for the course, students will explore the themes of the course through interactive tasks that draw them into the realm of Computer Science and establish "habits of mind" for their approach to course content. Students will learn about the greater context of computer science (i.e., it is not just about code and programming), and how different types of technological revolutions have had a significant impact on how humans communicate, work together, and solve problems. Students also will compare examples that illustrate the extent to which technology has a positive or negative role with respect to solving "human" problems, and how such revolutions may create new problems. Students will be introduced to the broad themes for the course through snapshots of high-profile current events to be explored in greater depth later (e.g., Apple versus the FBI), case studies of well- or poorly-designed products (e.g., Facebook vs. JuicyCampus.com), and analyses of new products geared towards teenagers (e.g., Kik or Snapchat or a new video game). In addition, students will be able to begin to articulate multiple perspectives about the role of technology in society and the pros and cons of innovative products. Key concepts: computer science, programming, coding, innovation, revolution, technology, digital, Internet, ethical, moral, "human" problems.

Unit 2: The Magic of the Machine

The Magic of the Machine unit sets the technical stage for the course with some hands-on hardware exploration, use of some apps to identify the basic steps from input to output, and experiential activities to help students understand the Internet and how it works in a general way. Students will investigate a range of digital devices (e.g., Roomba, microwaves, interactive toys, digital thermometers, cameras, Fitbits, etc.) to determine how they accept input and provide output. They will then trace a path of data flow from input to output within a device, before moving on to trace the flow of information between different types of devices. Students also will learn how computers and other devices store information in "codes." Several assignments will allow students time to build their own simple devices: they will explore how codes work and invent their own device that allows them to communicate in code. They will create their own flowcharts depicting information flow and make simple hardware devices. The overarching theme of this unit will be to support students' understanding of the relationship between hardware and software: how the network makes communication a reality between discrete devices. Key concepts introduced in this unit will include input, output, code, function, data, transmission, bits, server, cloud, network, flow, Internet, storage, binary, digital.

Unit 3: Why and How We Innovate

Building on the brief overview of Computer Science provided in Unit 1 and the connections between hardware and software in Unit 2, Unit 3 will focus on supporting students' understanding of how and why new digital products are created. Tasks in this unit will show how new products (at least the successful ones) fit definable needs and desires of a specific audience, and that meeting these needs can be measured qualitatively and quantitatively. This unit will address some of the "soft skills" of product development: products are developed creatively, collaboratively, and iteratively, with an eye towards competition, legal, and historical evidence. Students will be introduced to the design process: researching background information about a problem and existing solutions, brainstorming innovative solutions or modifications to an existing solution. Students would learn different ways to research a problem: surveys, interviews, observation, historical data review, legal and patent requirements, and learning the benefits and limitations of competing products. The class will follow a model design thinking process, develop a prototype, test their prototype, and analyze the data. Key concepts will include design, research (process), quantitative and qualitative data, testing, user interface, iteration, prototype, target audience, market, metric, criteria, bias.

Unit 4: Exploring Models Designed to Solve Human Problems

In Unit 4 students will develop their algorithmic thinking skills using a variety of models and processes. Building on the lessons learned about designing a product to meet the needs of a target audience, students will draft a digital tool that requires user input and potential responses to that input. Unlike Unit 3, which focused on the audience and how to learn more about potential users' needs, Unit 4 will dive into what happens when users interact with the digital product. Students will come up with a testing plan, include known "bugs", and create a flowchart that indicates how users' input will travel through a series of steps into defined output. Students may use pHet simulations or create their own digital tool using MIT App Inventor to reflect on how digital tools are designed and what challenges may be encountered by the user and the designer. By the end of the unit, students will understand what an algorithm is and the criteria for a good one. This may include visual representations of identifying inputs and outputs, steps in a sequence needed to solve a problem, iteration, and selection. In addition, students will be able to define a set of primitive data types and objects relevant to a system or process using a graphical tool. Students will explore properties of objects (what is constant, what can vary) and learn the basics of Boolean operators, numbers, lists, and Strings. Key concepts to be explored in this unit will include algorithm, iteration, limitation, variable, flowchart, function, loop, decomposing, conditionals, trial and error, criteria, parameter, constraints, model, prototype, variables.

Unit 5: Using Logic to Get What You Want

In Unit 5, students will learn how, in the digital world, we are limited in what we can represent through system design and logic. Using an online, interactive textbook, "Introduction to Logic", students will learn propositional and relational logic through games and real world examples. They will then apply their logic skills to identify ambiguity in an English language description, write queries to answer practical questions, write precise algorithms, and determine how to "debug" challenges in the digital realm and in everyday life. In their exploration of logic, students will learn how to use matrices, Venn Diagrams, and truth tables to organize relationships to formalize a logical process and reach a conclusion. They also will use the diagrams to evaluate how well an algorithm works and whether it is efficient. Students will make comparisons between targeted queries using Boolean logic versus less scripted language and determine how logic can help increase efficiency. Once students understand how logical statements can streamline their efforts, the class will focus on how to identify the attributes needed to determine how to best search for something in real life (e.g., moving to a new home: education, safety, income, cost) and in the digital world (e.g., Netflix movie suggestions, music streaming, etc.). Students will end the unit applying what they have learned about logic to write a program that uses several sets of attributes (students will know attributes and their ranges of possible values, but not actual values) to make a conclusion or complete a process. Key concepts: Boolean, Venn Diagram, matrix, truth tables, variable, constant, attribute, conclusion, logic/logical thinking, accurate, query.

Unit 6: The Impact of Technology on Society

This unit will deepen students' understanding of how social networking, the widespread availability of information, and the evolution of desktop publishing have changed the world in positive, biased, and negative ways. Students will evaluate the impact through conversations about case studies that present them with legal and ethical dilemmas. They also will read commentary on the challenges of defining the ethical parameters for a swiftly evolving digital culture. Students will apply this learning to a capstone project that serves as a culminating experience for the course. The capstone project will follow the design steps students learned about in Units 3 and 4, but be applied to a broader, community-focused problem. Students will determine something their community needs, and apply their knowledge from the course to create a digital solution for that problem. Key concepts: design, community, ethics, legal, moral, security, data/big data, copyright, impact (of technology), (data) permanence, patent.

KEY ASSIGNMENTS:

Unit 1:

Sample Assignment #1: Exploring the Role of the Internet

Objectives: Students will be able to communicate the positive and negative role of the Internet in society; define "digital citizenship" and reflect on the type of digital citizen they believe themselves to be.

Task 1: Students write a response to the following questions and share with a partner and/or the class their thoughts:

1. What are the key characteristics of the Internet that make it different from the offline world? (Ivester, p. 6)
2. What questions do you ask yourself before posting on Instagram, Facebook, Snapchat, or a blog?(Ivester, p. 6)
3. Have you ever put up a picture or tweeted/posted something that you wish you hadn't? What did you do (or try to do) to remove the post? (Ivester, pp. 6-7)

Task 2: After a discussion, students will begin reading the Preface to Matt Ivester's book *lol... OMG!* and consider the following questions:

1. Why isn't "online gossip the same as offline gossip"? (p. xvii) What characteristics make them different? Is one more
2. How did Ivester try to solve the problems that cropped up on JuicyCampus? Why do you think his solutions failed to work?
3. Write about a time you had an experience that you thought would be "fun (lol)" but turned into something else "(OMG!)"--this can be an online or offline experience [or assign students one or the other].
    1. What did you learn from this experience?
    2. Share your experience with a classmate who experienced the other [online or offline] and discuss the ramifications of each experience and whether one was "worse" than the other.

Task 3: Read Chapter 1: "High School in the Digital Age" of Matt Ivester's book *lol... OMG!* And...

1. Consider your "digital trail": on how many websites, email servers, apps, etc. (e.g., School Loop, Infinite Campus, Google) do you have accounts? Is the content in these accounts something you would be ok having your teacher see? Your parents? Your friends? How do you manager your "trail"? [This will be connected to Chapter 7 in the book and more in depth discussion and exploration of their "trail".]

2. Do you agree or disagree with Ivester's comment on page 4 that "Mistakes are inevitable... one of the greatest challenges facing students today." Why? Why not--what is a bigger challenge?

Unit Project: The Evolution of Technological Revolutions

Objectives: Students will articulate in written or oral form the evolution of a tech product and its impact on humans in the 21st century; students will be able to differentiate products with a continued impact (i.e., the wheel) versus those that have had minimal impact or are obsolete (e.g., 8-track tape, Betamax) and make conclusions about the relative impact of the invention.

1. Students (individuals or pairs) choose a man-made product and conduct research on its history and evolution.
2. Based on criteria (determined by the class or another source), students will determine the impact of the product on humans and any other stakeholder (e.g., the environment, animals, etc.).

3. In a google document and/or presentation, students will make conclusions about the relative impact of the product they chose and (if pertinent) explain what might cause the product to become obsolete in the future.

Unit 2:

Sample Assignment #1: Input/Output

Objectives: Students will be able to trace a path for information travel in a computerized device by identifying inputs and outputs.

Task 1: Model identification of input and output devices for PCs, and other common electrical systems.

- With a computer connected to several IO devices (keyboard, webcam with microphone, network, monitor, projector, speakers), have students identify ways in which people interact with the machine. Then, categorize components as input devices or output devices.
- Present students with a picture (or live version) of a more complex, non-PC electrical device. Repeat the exercise using this device's inputs and outputs.

Task 2: Student groups identify components of input, output, and processor of various types of computers and electronic devices at each lab station and compare types of input and output. Reflect on what they believe to be the relative complexity of the "machines" they examined. Machines may include but will not be limited to

- Microwave
- Fitbit watch
- Document camera by itself and/or plugged into a computer
- Interactive toys
- Roomba
- Scanners
- Thermometers
- Webcams

Sample Assignment #2: System Debugging

Objectives: Students will be able to apply their understanding of the flow of information from input to output by systematically debugging a system.

- Identify input(s), output(s) and the chain of components connecting them.
- Understand that any element in the chain could be responsible, and they can be independently tested by substituting.

Task 1: In a teacher-led activity, students identify input, output and processor in a demo with an arduino that connects a button and an LED. When the demo doesn't work, students identify possible causes. Teacher (or student) tests each student hypothesis by substituting another LED, arduino, button or wire until the system works.

Task 2: Students are given a picture of a laptop with a document camera and a projector attached. A "story" prompt explains that their teacher can't give the lesson because they can't project. Students use their understanding of debugging to explain the different possible causes and make a recommendation for steps the teacher could follow to find the true cause.

Sample Assignment #3: Creating Code (Part of the Final Project)

Objectives: Students will create a systematic code (student-defined) with a key to meet a need to communicate a specified range of information. They will demonstrate how to use a range of variants of information and understand that increasing the range of variants necessitates more complex storing of information (0, 1 is simple, Morse Code allows us to communicate words).

Task 1: Introduce the concept of how one can communicate using a code in which one set of symbols is used to represent another set of symbols (e.g. numbers represent letters).

1. Send a secret message to your friend using the code A = 1, B = 2, etc.
2. Show them the ASCII table, which is the actual code that computers use to represent letters as numbers.
3. Observe that this isn't binary. Introduce another "code" where each decimal number is represented as a fixed-length binary sequence. The big idea is computers might use more than one code so they can eventually represent information as binary.

Task 2: Discuss what sequence of codes would let you represent a black-and-white image in binary.

1. Students are given a 10 x 10 image with black and white pixels. They use the code that black = 0 and white = 1 to represent the image in binary and see if their friend can re-construct the original image.
2. Students are given a 10 x 10 image with 4 colors: black, white, red and green. Using the code that black = 0, white = 1, red = 2, green = 3, and a code from decimal to binary, repeat the same activity.
3. Optionally, the teacher could open an image file in a hex editor and display it in binary so students can "see" that computers use the same code they've been using.

Unit Project: Sending Messages
Objective: Students will demonstrate understanding of code and connectivity by sending a message to another group of students over some distance (such as another room), connected only by a set of wires in a circuit.

1. Students are provided with the type of information they will be sending. Then, they will define a code to enable communication over a wire connected to a digital input and output.
2. Students are provided with a selection of input/output devices. Groups choose a set of devices and connect the devices to create a simple circuit.
3. Students are provided with a message from the teacher. Students use their defined code to attempt to send the message to their group-mates.

After implementing their communication device, student will reflect on their success/failure to communicate their message. For example, students may indicate that the code has some ambiguity to it that caused confusion in the transmitted message, or student may have had some ambiguity in the protocol used to transmit the message. They will "troubleshoot" their own code and recommend ways to improve it.

Unit 3:
Sample Assignment #1: Product Brainstorm--Wallet
Objectives: Students will be able to describe the multiple purposes of products, use evidence (personal experience, online comments, survey results) gathered from the target audience to support the need for product features, and create a simple prototype for a new product.

Task 1: Students watch **Stanford Design Thinking Virtual Crash Course** https://www.youtube.com/watch?v=-FzFk3E5nxM. Then students are introduced to the basic concept of a wallet and use Google Images to look up pictures of various wallets. They will read reviews for wallets (e.g., on Amazon) to get an idea of the features that are desired by users, and the deficiencies of existing products. Key questions students would need to be able to answer include:

1. In what ways can wallets vary?

2. Do specific models of wallets seem to be marketed to specific groups of people?
3. What are some different purposes of a wallet? (hold money, cards, phones, be fashionable, etc.)

Task 2: In small groups (3-4 students), students design a new wallet. It can be any type of wallet for any age or gender of person. Each group's design must include:

1. Goals for their wallet
2. The target audience
3. A sketch or 3D model
4. Features list, with evidence for the need for each feature (their own, or hop on Amazon and see what people write in the comments, etc.)

Task 3: Groups then share their model with 2-3 potential users to get feedback. Based on the feedback note at least one feature of their wallet they would need to modify before they market it.

Sample Assignment #2: Google Survey

Objectives: Students will be able to create a survey that will help them determine what features of a product their customers would want; interpret data from their survey to identify the wants and needs of their intended audience; evaluate criteria for an effective survey; use with accuracy key vocabulary related to surveys and data: sample, outlier, average, mean, frequency, criteria, quantity, quality, data, bias, reliability, validity, accuracy.

Task 1: The class will choose a product that they would like to learn more about (e.g., wallet, bicycle, etc.) and determine the target audience(s) for this product. They will then

- Determine the best way to collect data for this audience
- Determine what data needs to be collected
- Determine what types of questions will best yield the type(s) of data that need to be collected
- In group of 3-4, write the questions in different ways (e.g., open ended, forced response, Likert scale, etc.)

Task 2: Groups use Google Forms to create their respective surveys and distribute the survey to at least 10 respondents. Students review their survey results to determine

- What their target audience needs/wants to improve the product
- Whether their data is statistically reliable, accurate, valid

Task 3: Evaluate the criteria for making an effective survey by comparing the different types of data from the different types of questions and responses asked (e.g., review how an "open ended" response data comes back vs. Likert scale data). Students will reflect on

- The types of questions to include (i.e., to minimize bias)
- The numbers of questions to include (i.e., to maintain validity while also motivating respondents to complete it)
- How to ensure the survey will result it "quantifiable" data

Sample Assignment #3: Creating Models for User Interface Design

Objectives: Students will be able to identify and explain criteria of an effective UI Design; design a paper model UI for a specific purpose; identify testing rules for their model UI.

Task 1: Students watch Example Usability Test With Paper Prototype: https://www.youtube.com/watch?v=9wQkLthhHKA and show examples of bad paper prototypes. Students will then identify attributes of good prototypes and create a paper prototype is modeled as a class. In terms, students brainstorm ideas and create a prototype for their unit project.

Unit Project: Create a Website
Objectives: Students will be able to create a website that advertises a product; use effective oral presentation skills when sharing their website and product with the class.

Task 1: In groups of 3-4, use Weebly to create a website that advertises a product, that explains its features, data showing the results of testing, embed a video with a "pitch" to the target audience, why/how it beats competitors' products.

Task 2: Each group will create a multimedia presentation (i.e., embed the website into a PPT or Prezi) and present to the class their website and product. Group will need to explain their product's features, target audience, why it is unique, and have data showing the product's reliability.

Task 3: Classmates (and other school staff or another class) will evaluate each group's pitch (using presentation and product rubrics) to determine which product will be chosen for a company to sell.

Unit 4:
Sample Assignment #1: Ambiguous Algorithm for Drawing Something
Objective: Students will be able to demonstrate what "algorithmic thinking" is, and how they use it all the time without realizing it.

Task 1: Students are first given a "bad" algorithm for drawing a picture of something and draw it. Students compare drawings and see that there is much variation due to missing information and ambiguity. Elicit from students criteria for a good algorithm: steps should be unambiguous; include all the necessary information (explicit); correct (it should produce the desired result).

Task 2: Show students some examples of flowcharts of some common tasks (baking cookies, should I do laundry?, what I do after school, when is it acceptable it nap, etc.). Students choose an algorithm to make into a flowchart.

Sample Assignment #2: **Boat Crossing Problems**
Objective: Students will be able to articulate the algorithms used to solve each puzzle. Students will recognize the impact of constraints.

Task: Students begin by playing the river crossing game at http://www.transum.org/software/River_Crossing/Level1.asp. There are three levels - students start at level 1 and move up to 3 as they solve each river crossing problem. After modeling how to articulate the level one problem, students write out the algorithm (steps) for the level two problem. Ask them to share their experiences and how they went about solving the problems. Explain that what they just did - finding the solution for each puzzle - is what is called "algorithmic thinking." You have discovered a method to get all the objects, robots, monsters, etc. to the other side. At the end, students draw a flowchart to capture the algorithm.

Unit Project: Implement the Design Process using Algorithmic Thinking
Objectives: Students demonstrate how to define a problem and implement a technological solution using MIT App Inventor (or similar software). Students will demonstrate knowledge of how their solution works algorithmically, what "bugs" it may have, and what the next version might need.

Task #1: Learn the Basics of MIT App Inventor
Introduce MIT App Inventor with tutorials/labs throughout the unit: http://appinventor.mit.edu/explore/ai2/tutorials.html

Task #2: Reflecting on the Algorithm
Once students have created their App, create a document (flowchart, list, outline) that demonstrates how the algorithm works. The group will then share how the next version of the App will look based on what they know from testing the algorithm, finding the "bugs", and determining how to fix them.

Unit 5
Sample Assignment #1: Translating Newspaper Headlines
Objectives: Students will be able to decipher the ambiguities found in newspaper headlines and use logic to correct them.
Task 1: After reading Chapter 1.3 of "Introduction to Logic", pairs of students receive one or two different newspaper headlines (either those found in Figure 5, or other examples) and come up with a number of options for what the title could mean.

Task 2: Students rewrite the headlines to clarify the intended meaning and explain where the ambiguity was in the headline.

Unit 6
Sample Assignment #1: Right to Privacy vs. National Security
Objectives: Students will be able to articulate to peers the implications of a case related to an individual's right to privacy; determine the main ideas of an article (news, magazine, etc.) informing the public of the issue; differentiate the main issues and facts from the arguments in favor of one side or against another; distinguish the legal and ethical implications of the issue.

Task 1: Students read "Apple Fights Order to Unlock San Bernadino Gunman's iPhone" (Lichtblau & Benner, NYT, 17 Feb 2016) and, in pairs or triads, note the main ideas from the article, including the key issue(s) in the case being presented. Students will then to begin to come to consensus as a class regarding the main ideas, legal & ethical issues.

Task 2: Students read the introductory comments & respond to questions to 5 opinions about this issue: *Should companies have to unlock encrypted communication in the case of a crime?* (NYT, 18Feb2016). Based on the first article and the opinion, as a group, students will come to consensus about what they believe Apple should do and determine the legal and ethical implications. They will share their decision with the class.

Sample Assignment #2 [Part of Capstone]: How will the product be a solution to a given problem? What are the potential legal and ethical issues related to our team's product?
Objectives: Students will be able to articulate orally and in writing (via a White Paper) how well their product meets the community's needs and what, if any, legal or ethical implication there may be when users encounter/use their product; integrate the information from their White Paper into a formal presentation about their product to an industry panel.
Task 1: After students complete a prototype of a proposed solution to their community problem [Steps 4-1 & 4-2 from IDEO's *Designer's Workbook*] review the feedback to determine how/where the prototype could lead to ethical or legal challenges.

Task 2: Write a White Paper in which they explain how their product will meet the community's needs by providing evidence from their own research (surveys, etc. from their target audience) and research on similar products. Their paper also must address any potential legal and/or ethical implications of the product and how they are mitigated by the benefits of the product.

Task 3: Students will incorporate key points from their White Paper into a presentation to an industry panel or a VC Fair at a central location.
Grading criteria for the White Paper:

- Provides a thorough explanation of the problem the product is trying to solve (includes evidence from data collected or sources available via research)
- Explains why the product is a solution & how it is expected to make an impact
- Includes any potential legal or ethical pitfalls with the product & how the product's benefits mitigate those pitfalls
- Effectively follows the appropriate format & organization for a White Paper
- Explains effectively any graphics presented in the White Paper
- Cites resources correctly

INSTRUCTIONS METHODS and/or STRATEGIES:

Guided Practice & Modeling:
Students follow steps illustrated by teacher on projector. The teacher and students will always have nearly identical views of the computer.

Cooperative Learning:
Students will always be grouped in groups of mixed abilities. Even during regular instruction time students will be consistently encouraged to help one another. When students ask questions, the teacher will encourage their assigned partner or group to help them come up with a solution.

Supervised Individual Application:
After periods of initial guided practice and modeling students will have time to practice the skills on their own terms. The teacher will circulate the room helping students achieve individual goals, troubleshooting technical issues, exploring possible logical strategies for solving problems, and/or coaching any students in need of more extensive lessons.

Self-Discovery:
When new tools or information are presented to the class, the teacher will strive to go beyond merely delivering the information. That is the teacher will always lead students to the correct methods by asking questions, probing and encouraging students to explore.

Structured Discussion:
During and after any period of instruction, students will always be encouraged to ask and answer questions. This is especially important during any analysis of a code or game sample. Students will always be placed into class and group discussion for information and analysis. For example, during analysis of video game genre, students will get into groups and have discussions about the discovery each student makes in their research to generate a larger report to share with the class. Many discussions will have students act within a specific role (time keeper, recorder, skeptic, prober, etc.).

Student-Centered Critiques:
After key assignments and between drafts students will engage in a respectful but honest discussion on the quality of work turned in. Most of these critiques will be done verbally as a class. Each student's work will have a turn to be critiqued. The teacher will encourage a discussion of both the strengths and weaknesses of any given piece. Ideally, the teacher will facilitate the critiques but not necessarily be a principal participant. Critiques may also have a written component.

Project Based Learning:
A student and group-based approach that focuses on creative problem solving. The course consistently asks students to think of solutions to real world problems. As an instructional method, project based learning encourages students to take ownership of their learning in authentic situations. That is, when students are asked to directly engage with relevant problems in a meaningful way they are more likely to become independent 21st century thinkers.

ASSESSMENTS INCLUDING METHODS and/or TOOLS

Participation:
Each day students are expected to participate during instruction. Students are encouraged to follow along in guided practice and to ask/answer question. Keeping track of participation holds students accountable for learning on a day to day basis and makes contribution a part of the classroom environment.

Presentations:
Students present their research findings, inspiration, or code product to the rest of the class for peer feedback and teacher feedback. This occurs at least once per unit-- usually as the culmination of their learning. Students are graded with a rubric based on communication skills: public speaking, visual presentation and depth of understanding of the topic. This method holds students accountable for both individual and group work and forces students to take ownership of their work in front of their peers. Two more substantial end-of-semester projects provide higher stakes: these presentations are made to a mixture of family, community members, and professional judges.

Written Assignments:
Students are consistently asked to demonstrate their understanding in written format. These range from small daily assignments (warm ups, exit cards) to more involved assignments (research essays, written critiques, written self-evaluations). Students are graded with a rubric based on their ability to meet the goal of the assignment, which range from persuasion, objective criticism, informed analysis and reflection.

Individual Assignments:
Throughout the course students are given daily or weekly individual assignments to demonstrate their understanding of a particular programming or design skill. Many of the assignments happen in class but some require work outside of class. Students are graded with a rubric based on their ability to meet the goal of the assignment. These assessments enable students to explore tools and strategies on their own and sharpen their creative problem solving skills. In other words, these assignments allow students to discover learning and problem solving on their own.

Group Assignments:
These are assignments and projects that students work on in teams of two to four members. Each member will be expected to take on a specific role that complements their strengths. These projects enable students to demonstrate teamwork, communication, leadership, and many other CTE goals.

Project Based Learning:
A student and group-based approach that focuses on creative problem solving. The course consistently asks students to think of solutions to real world problems. As an assessment method, project based learning tests students in their capacity to take on real world roles in this CTE field. That is, these assessments measure not only student talent but also their capacity to take on collaborative career roles. Can students become effective leaders? Can they push themselves to work with others? Can they complete difficult work under competitive pressure?

INSTRUCTIONAL MATERIALS:

Textbooks

Title	Author	Publisher	Edition	Website	Primary
lol...OMG! What Every Student Needs to Know About Online Reputation Management, Digital Citizenship, and Cyberbullying	Matt Ivester	Serra Knight Publishing	High School Edition/2012	[empty]	No
Introduction to Logic	Michael Genesereth	Michael Genesereth	Online/ 2015	http://logic.stanford.edu/intrologic/	No
The Big Switch: rewiring the world from Edison to Google	Nicholas Carr	W. W. Norton & Company	1st/ 2013	[empty]	No
Learning MIT App Inventor: A Hands-On Guide to Building Your Own Android Apps	Derek Walter & Mark Sherman	Addison-Wesley	1st/ 2014	[empty]	No
The New Way Things Work	David Macaulay	HMH Books for Young Readers	Revised edition/ 1998	[empty]	No
Our Digital World	Lankisch, Karen; Muir, Nancy; Seguin, Denise; Vemo, Anita; Gordon, Jon	Paradigm Publishing	2nd edition/ 2013	[empty]	No

Websites

Title	Author(s)/Editor(s)/Compiler(s)	Affiliated Institution or Organization	URL
MIT App Inventor Tutorials	MIT App Inventor Team (Abelson, Hal; Diaz, Marisol; Lang, Karen; McKinney, Andrew; Schiller, Jeff; Sheldon, Josh)	Massachusetts Institute of Technology	http://appinventor.mit.edu/explore/ai2/tutorials.html
The Easiest Way to Make a Website (weebly)	Domenic Grignano	Weebly	http://www.weebly.com/ and http://education.weebly.com/

For CTE Pathway Distinction:

Sequence of Courses:
Interactive Design CTE Pathway
1) **Coding and Gaming**
2) **Webpage Design**
3) **Digital Innovation and Design**

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